25X1

Approved For Release 2002/08/20 : CIA-RDP78B04747A003000050001-3

[redacted]

[redacted]

POWER ASSISTED DRIVE
FOR
[redacted] LIGHT TABLES

[redacted]

June 1965

Copy 5 of 5

25X1

The designs of the [redacted] Film Viewing 25X1
Light Tables currently being designed and fabricated [redacted] 25X1
[redacted] employ purely mechanical means for film transport. Although
this is in conformance with the wording of the design objectives, 25X1
[redacted] believes that the incorporation of a power assist
feature is highly desirable and should be considered immediately. 25X1
The design changes recommended herein are prompted by the realization that the physical effort required to transport the film, especially at high speeds, will be excessively fatiguing from a human engineering viewpoint. The design change we proposed would eliminate the problem of high slewing torques while at the same time would retain the basic mechanical drive configuration even permitting wholly mechanical operation of the film transport.

Specifically, it is proposed to incorporate a servo motor and associated control circuitry to give a full power assisted film transport capability to the instruments. The motor would be coupled to the appropriate film spools through electromechanical clutches. To transport the film, the operator would turn the handwheel as in the present design, however, the actual power required to rotate the film spools would be supplied by the servo. The torque reflected to the operator's hand would be negligible. This is accomplished by the use of torque motion sensors between the handwheels and the spool drives. As the handwheel is turned, the displacement between it and the drive is sensed and a proportional voltage generated. This voltage is amplified and used to drive a servo motor which operates the film spools while at the same time reducing the displacement at the error sensor. This arrangement permits a high degree of control at the handwheels while eliminating the manual power.

In addition, switches will be provided to allow the operator to automatically slew the films without having to touch the handwheels. To eliminate any hazard to the operator during this mode, the handwheels will be provided with mechanical clutches. An electrical interlock will prevent the use of the automatic slew mode unless all the handwheels are declutched. 25X1

If necessary, because of operator preference or malfunction of the motor or control circuit, it will still be possible to operate the film transport in a purely mechanical mode. This is accomplished by designing the handwheel torque motion sensing mechanism so that it may only go through a limited excursion before a mechanical stop is encountered and a direct mechanical drive obtained. During the mechanical mode of operation the motor will be automatically disconnected from the gear train, thus eliminating additional drag. Both high and low speed ranges will be available in the manual mode as they are in the present design.

In regard to the physical changes necessary to accommodate the power assist feature, the [redacted] design would require an increase 25X1 in width to 18 1/2 inches from the current 16 1/2 and an increase in height to 11 inches (distance of viewing surface from supporting table) from the current 10 inches. The current dimensions are those which have been requested in our letter of 7 June 1965. In regard to the additional electronic components required, it is preferred to mount these in a separate enclosure (approximately 9 x 12 x 6) which may be remotely located. It is possible however, to mount these components on the main tilting base assembly at an increase in cost. The base assembly may have to be enlarged, but it will still be within the overall dimensions given above.

The present estimated weight of the [redacted] system is 105 pounds. The addition of the motors, clutches and support results in weight of 120 pounds. If the controller is added as a part of the Light Table, the total weight is estimated at 130 pounds. 25X1 25X1

Dimensional changes required on the [redacted] designs would consist only of an increase in height of one inch from 7 to 8 inches. Again, the electronics may be housed in a separate cabinet, or may be contained within the Light Table at some additional cost. 25X1 [redacted] [redacted]

25X1 25X1

REGISTERED

TUESDAY

24 August 1965

25X1 [redacted]

Subject: Power Assisted Drives [redacted] 25X1

Ref: [redacted] 25X1

Gentlemen,

Per your verbal request of August 23 and our telephone conversation this date, this will confirm and modify our proposal of reference letter increasing the quoted price [redacted] and modifying the delivery schedule to: 25X1

25X1 [redacted]

February 11, 1966
February 25, 1966
March 18, 1966

The reason for this increase in price, from that originally quoted, and for the extended deliveries is due to the fact, as implied in our reference letter, that design had to continue in accordance with the existing contract terms. A considerable amount of this design, as well as vendor items, have since occurred which must be changed, to incorporate the contemplated amendment. It is understood that the proposed amendment to the subject contract will be altered to comply with the submitted price analysis, under the same terms and conditions of the original contract.

It is assumed that any go-ahead of this proposed amendment will be received prior to August 31, 1965. If we do not receive go-ahead by this date, it is quite conceivable that the costs quoted and deliveries stated would be further increased and extended.

If you have any questions in relation to the foregoing or require any additional information, please contact the undersigned.

Very truly yours,

[redacted] 25X1

LHB/de
Enc. - Sheet 2

"THIS DOCUMENT IS DECLASSIFIED WHEN SEPARATED FROM ENCLOSURE(S)."

Approved For Release 2002/08/20 : CIA-RDP78B04747A003000050001-3

 See revised copy

Research and Development
Project Approval Request

I. Identification

The National Photographic Interpretation Center proposes the development of two groups of three prototype light tables for use in film viewing operations. These tables, of three different configurations, are designed as superior replacements for similar types of equipment presently in operational use. The project will be conducted as a parallel development effort [redacted] Although the project was originally incorporated in the Third Quarterly Review of FY-64 Development Program, budgetary consideration dictated that it be programmed for Fiscal Year 1965 under Category II "Viewing and Photo Interpretation Equipment." If the budget situation changes, and time permits, this item should be reconsidered for Fiscal 1964 because of its high priority.

25X1 25X1

II. Objectives

The results of this development will be six prototype advanced-concept, film-viewing light tables -- three different tables developed by each manufacturer. The three types are: (1) An 11" x 18" format tilt-top unit, (2) an 11" x 40" format unit with translating microscope carriage and (3) an 11" x 40" unit with translating microscope carriage and integral tracking high-intensity light sources.

This project should result in sophisticated (but reliable) prototype light tables, built with proper attention to human engineering, and which are to be evaluated under actual operational conditions by photo interpreters. The desired final product of this development program would be prototypes which could be further refined and then manufactured on a production basis to replace current operational models.

III. Background

The present 9" x 18" format "tilt-top" and 9" x 40" "motion-carriage" light tables are two of the most heavily used pieces of equipment not only at NPIC but also throughout the Intelligence Community. These units, while functional, are generally awkward and uncomfortable to use because they require the viewer to sit in an unnatural position and have controls which require uncomfortable hand or arm movements. The current "tilt-top" table, when tilted, requires cranking with the right or left hand in a position approximately three inches above the head -- an extremely fatiguing position after a few hours of steady work. In addition, it is difficult to load and has poor stability (balance) while the film is being cranked; furthermore, the light source does not provide adaquate light intensity and is subject to "flickering" when dimmed for use with low density film positives.

The 9" x 40" motion carriage unit has many of the same disadvantages as well as some additional problems. The stereomicroscope is mounted upon a motion carriage which is designed in such a manner that it is difficult, if not impossible for the operator to sit comfortably and uprightly on a chair, while looking through the stereomicroscope. The operator is forced into a backstraining position. In addition, the hand wheels required for transporting the film are not conveniently located. Human engineering was not thoroughly considered in the design of this equipment.

All of these features introduce high fatigue factors and inefficiency into the photo interpretation operation. Since the highly skilled photo interpreter is the most important single element in the P. I. process, equipment which has not been engineered for maximum efficiency and comfort creates penalties we cannot afford. Two of the proposed prototype table-types are units designed to replace present equipment. The third table is designed in anticipation of solving future problems. As the resolution of film materials increases, they must be viewed with higher and higher magnifications; consequently, there is a point at which general diffused illumination from the light table becomes inadequate and high-intensity light sources are required. Since the microscope translates, these high intensity sources must track the objective lenses. The third table-type is designed to accomplish this.

IV. Technical Specifications

A. Advanced Tilt-Top Light Table

The units to be built by both contractors will provide the following advanced features:

1. Handling (up to) 500' single rolls of $9\frac{1}{2}$", 5" or 70 mm film, or dual rolls of 5" or 70 mm film concurrently.

2. Increased illumination up to 1800 foot lamberts, continuously variable from 15% to 100% of full intensity, without visible evidence of "flicker".

3. Adjustable sub-stage shades to block out all of the illuminated surface not actually covered by film.

4. A unique, completely reliable film drive that will permit bi-directional film motion and controllable from either end: i. e., it will permit both winding and unwinding with the same crank at one end of the table. In addition, the drive will incorporate

a two-speed feature to facilitate high-speed slewing. [redacted] system is a purely mechanical system which is very desirable from the reliability standpoint [redacted] uses an electro-mechanical approach.) 25X1 25X1

5. Fast, positive loading and unloading mechanisms.

6. A film transport mechanism that maintains a light, constant tension to keep the film flat and in contact with the glass surface. This tension is automatically eased when the film is transported. The contractors have different approaches to this problem.

7. Tilt mechanisms that permit tilts of (up to) 75° on one axis and 45° on the other.

B. <u>Advanced Film-Viewing Light Table with a Translating Microscope Carriage</u>.

For these, both contractors will incorporate all of the tilt-top unit except for item A7. In addition, the following features will be added:

1. An 11" x 40" illuminated area vice 11" x 18".

2. A height adjustment of 3" and a tilt adjustment 0° through 15°.

3. An advanced, precision carriage for translating microstereoscopes or steromicroscopes in both X and Y over an area of 10" by 35" of the total illuminated format. Adapters are provided for mounting [redacted] microscope. 25X1 25X1

4. A fine micrometer X-and Y-microscope motion over $\pm$ 2cm in travel, which can be implemented once the main translational carriages have been locked in position. This precision motion is graduated and accurate to .001 mm plus .01% of the total distance being measured.

C. <u>Advanced Film-Viewing Light Table with Translating Microscope Carriage and High-Intensity Tracking Light Source</u>.

This unit is basically the same as Item B above, with the following exception:

1. Two high-intensity, condenser-type light sources are provided which are positioned between the general illumination source and the surface glass plate and are independently adjustable so that they can be adjusted beneath the objective lenses of the microscope. When the microscope and microscope carriage are translated, the high-intensity light sources will track the objectives. [redacted] proposes a unique fiber-optic system with magnetic or mechanical tracking linkages [redacted] proposes a mechanical mirror system for positioning (by means of reflection) externally-mounted condenser sources. 25X1 25X1

V. <u>Contract and Financial Arrangements</u>

This project will be accomplished under two parallel contracts:

25X1 A. A two-phase [redacted] CPFF or CPIF contract [redacted] for a feasibility study, development and fabrication of three prototype, advanced design, film-viewing light tables. The feasibility study would cost [redacted] and the construction of three prototype instruments an additional [redacted] -- for the total cost [redacted] Should the feasibility study prove unrewarding, the contract would be terminated at the end of Phase I at a cost [redacted] 25X1 25X1 25X1 25X1 25X1 25X1

25X1 25X1 B. A [redacted] fixed price effort [redacted] for the design and fabrication of three additional prototypes without a study phase. 25X1

Delivery of the three [redacted] prototype units is scheduled for ten (10) months from the actual award of contract while delivery of the [redacted] units is programmed for 7 months from award of contract. 25X1 25X1

Development of proposals were solicited from [redacted] companies [redacted] proposal was considered technically quite superior [redacted] 25X1 25X1 25X1 25X1 25X1

25X1 The [redacted] proposals are superior for the following reasons:

1. The drive system is purely mechanical -- an extremely important factor where reliability is concerned. We cannot afford unreliable equipment.

25X1

2. The [redacted] proposals were technically very thorough and complete: All of the problem areas had been recognized and feasible solutions offered.

3. Their approach to the overall design is highly desirable from the standpoint of mechanical simplicity and human engineering.

4. Past developments undertaken [redacted] 25X1 indicated that they have the engineering and mechanical capacity to design and implement the desired drive and film-tension mechanisms.

5. Two of the prototype units require measuring stages [redacted] specializes in this 25X1 type of equipment.

Because of the importance of the items being developed, and because of the high degree of sophistication required of the film drive and film-tension mechanisms, it is technologically prudent to undertake a parallel development.
25X1 [redacted] is suggested for parallel support because: their relatively low cost, fixed-price proposal -- though not as technically complete or as feasible as the [redacted] 25X1 proposal -- would provide at reasonable cost insurance toward obtaining successful tables within a reasonable time span. Development of film-viewing light tables is relatively
25X1 new [redacted] although they are extremely competent in R & D on photographic interpretation [redacted] 25X1 25X1 This parallel contract would provide an additional advantage of developing another potential supplier of equipment of this type. Competition is badly needed in this field. Even though the basic units are quite different in configuration and operation, there is significant overlap in the design of the light table components -- such as, the film holding mechanism and the sophisticated drive system. Consequently, there are considerable monetary savings in negotiating all three types of tables as a package with one manufacturer. Dividing the package between manufacturers could actually result in increased costs or fewer prototypes per given cost.

Although [redacted] bid on a CPFF basis it appears that this contract might be negotiated CPIF. If an incentive-type contract can be negotiated, P&DS will provide the Office of Logistics with appropriate technological incentive criteria. 25X1

VI. Coordination

The proposed development has been coordinated with representatives of both PID and PAG. The best of numerous suggestions, gathered from many different NPIC analysts, were incorporated into the Development Objectives upon which this project was based and are reflected in the contractor's technical proposals. By virtue of contacts throughout industry and the intelligence community it is concluded that no equivalent devices are currently in existence.

[redacted] 25X1

[redacted]

CONFIDENTIAL

[redacted]

25X1 25X1

25X1

25X1 [redacted]

23 April 1964

REGISTERED

[redacted]

25X1

Attention: [redacted]

Subject: [redacted] 25X1

Reference: Enclosures - see below

Gentlemen:

25X1 [redacted] is pleased to submit the enclosed proposals and quotations in response to your request for proposal [redacted] The enclosed cost analysis sheets (submitted in lieu of DD form 633) are computed on the basis of receipt of a cost reimbursement type contract which is felt to be compatible with the nature of the tasks proposed herein. These quotations will remain valid for 60 days from 24 April 64. 25X1

In the case of each item quoted, [redacted] has separated the costs, 25X1 per your request, into the categories of Feasibility Study and Operational Prototype. For instance, the cost analysis sheets attached to proposal [redacted] are as follows: 25X1

a) Cost analysis sheet "A" is for the entire program which includes both the Feasibility Study and the Operational Prototype.

b) Cost analysis sheet "A-1" is for the Feasibility Study, which will be completed within two (2) months after receipt of award.

c) Cost analysis sheet "A-2" is for the Operational Prototype Unit 25X1 described in proposal [redacted] the task for which will be completed within seven (7) months after receipt of award.

In requesting the Feasibility Study, it is felt that the government recognizes a difficulty associated with firm fixed price contracting at this time 25X1 for these articles. However [redacted] would certainly consider it reasonable to revise the type of contract to firm fixed price or fixed price incentive at completion of the Feasibility Study, if such is the desire of the government, at that 25X1 time. Since [redacted] did not include requirements for software such as drawings and instruction manuals, the quotations enclosed herein do not include costs associated with such software.

During the preparation of the proposals and estimation of the costs, it became evident that commonality of design for all three (3), or two of three, units proposed herein introduced a high probability of cost reduction if award of all three (3) were made [redacted] Therefore [redacted] has chosen to subm'

25X1 25X1

CONFIDENTIAL

GROUP 1
EXCLUDED FROM AU
DOWNGRADING
DECLASSIFICA

[redacted]

CONFIDENTIAL

[redacted]

23 April 1964

25X1

25X1

cost analysis sheets listed as enclosure "E" to this letter and identified as sheets ABC, A1-B1-C1, and A2-B2-C2; which are the costs associated with the task which includes Feasibility Study and Operational Prototype for all three (3) Tables. This cost would only be valid in the event that an award were made for concurrent development of the three (3) specified units. The program for such a concurrent development would include two (2) months Feasibility Study and an additional eight (8) months for design and fabrication of the three (3) units, or a total of ten (10) months from receipt of award to delivery. 25X1

[redacted]

Progress Payments are requested in accordance with applicable regulations.

Should you require any additional information in relation to the foregoing, please do not hesitate to contact the undersigned.

Very truly yours,

[redacted]

25X1

25X1 RJL/de

Enclosures: (A) Cover letter from you, dated 6 April 1964, request for proposal [redacted] and Development Objectives attached thereto for A, B and C (2 copies ea)

25X1 (B) [redacted] Advanced Tilt Top Light Table, and associated proposal estimate sheets A, A-1 and A-2.

25X1 (C) [redacted] Advanced Film-Viewing Light Table w/Translating Microscope Carriage, and associated proposal estimate sheets B, B-1 and B-2.

25X1 (D) [redacted] Advanced Film-Viewing Light Table w/Translating Microscope Carriage & Hi-Intensity Tracking Light Sources, and associated proposal estimate sheets C, C-1 and C-2.

(E) Cost analysis sheets for the three (3) Tables proposed herein in the quantity of one (1) each as ABC, A1-B1-C1, and A2-B2-C2.

CONFIDENTIAL

Next 12 Page(s) In Document Exempt

[redacted] 25X1

[redacted]

25X1

[redacted] 25X1

Proposal [redacted] 25X1

ADVANCED TILT TOP LIGHT TABLE

[redacted] 25X1

25X1

[redacted]

21 April 1964

COPY NO. 2 of 4

25X1

25X1

ADVANCED TILT TOP LIGHT TABLE

This proposal describes a design approach towards achieving the design objective for an Advanced Tilt Top Light Table in accordance with development objectives dated 29 January 1964. In the event of an award, the first consideration in the design will be to make a complete human engineering and mechanical analysis to determine the simplest and most reliable approach consistant with the design objective. The final design will not commence until all parameters to meet the objective have been firmly established.

Basic Concept

Seems good

In this design we have employed the use of thin wall ribbed aluminum castings to provide rigidity as well as strength. 356T6 aluminum is being considered. Although we are considering the use of fabricated metal and plate type construction for the light table, the cast material concept provides the freedom of design, allowing human engineering requirements to be most advantageously carried out. There is also the advantage of acquiring an aesthetically produced light table without additional cost.

The use of cast members will naturally provide economies in any future procurement.

The overall size is 32 x 16 x 9 inches high, including the tilting base but exclusive of the spools and handles.

[redacted]

25X1

[redacted]

25X1

General Description

As shown in Figure 1, the Tilt Top Table is provided with an 11 x 18 illuminated area for viewing single rolls of 9 1/2, 5 inch or 70mm film, or dual 5 inch or 70mm film in 500 foot capacity. The Light Table proper contained within the top casting supports the light source, diffuser, glass plate top, mechanism for transporting film and associated controls. This section is approximately 3 1/2-4 inches thick. The lower cast base is the support for the table on a desk providing tilt in two (2) directions. It is also the housing for the power transformer and illumination intensity control to the light source.

Detailed Description

Figure 1, displays a cross section of the light table showing the transparent top, adjustable shade, plastic diffuser, light source and side channels for the transport mechanisms. The top plate is made of glass with beveled edges.

The shades are made of synthetic rubberized fabric, mounted on rollers with the pulled edge of the shade supported between the diffuser and the glass top. The leading edge of the shades are metal edged for rigidity.

The shades are located at the edges of the long side of the table, extendable across the short dimension. The shade may be extended across the entire illuminated area from 0 to 9 inches from an edge. The shades are actuated by small belts over pulleys from knobs flush mounted near the top surface. A lock-in feature is provided.

[redacted]

25X1

[redacted]

25X1

The diffuser will be an opalized type plastic. The light source will be a shock mounted cold cathode type with a variable illumination from 100% to 15% without flicker. The illumination will provide a minimum of 1500 foot lamberts at the glass top surface. 2000 foot lamberts, or more, is a design goal. If the 110°F surface temperature of the top plate cannot be maintained with a heat sink, a small blower will be introduced to remove hot air. If a blower is needed, it will be a "muffin" fan type, which is essentially silent and vibration free.

25X1

[redacted] has manufactured a model [redacted] Light Table with 10 inch x 30 inch illuminated area having a brightness level of 2,200 foot lamberts at its maximum setting. The temperature rise is 32°F when film is placed on top of the table having a density of 3.0. When no film is present, then the maximum temperature rise is 20°F. 25X1

The above is presented to illustrate the investigations we are presently conducting. Such lamps are available for demonstration purposes.

The spool loading mechanisms consists of live driving centers, adjustable to pre-located key positions for when selecting the proper size spool. One each is located at A-B-C-D. The live center will contain a gear which will remain inmeshed with a pinion. After it is moved, it will be locked in to the changed positions. The keyed pre-located positions will be identified by a mark for simplicity of locating.

25X1

25X1

The center post is fixed, located on the center line of the long axis of the Light Table. It is hinged so that it may be moved out of the way when 9 inch spools are used. A simple locking device will be used to hold it in position when 70mm or 5 inch spools are used. The pivot center on the center post between the spools will be made of hardened steel for durability. The advantage to pivoting the center post, is that it eliminates the possibility of misplacement or accidental loss of the part.

As shown in Figure 1, the Light Table will accommodate one (1) 9 inch dual 70mm or 5 inch spool, or one (1) 70mm and one (1) 5 inch spool.

Segmented rollers are used so film may be transported with emulsion side up or down, or in various widths simultaneously.

The film transport proposed is purely mechanical, providing the necessary directional travel functions. A two (2) speed mechanical gear shift for one to one (1:1) ratio and three to one (3:1) for slewing is provided for two spools at one end of the table.

The configuration of the dual spool drives can be selected as one of two alternate approaches, separately shown in Figures 3 and 4. Each approach has its own merits, and separate evaluation will be made [redacted] during the design phase to determine the comparable reliability and human engineering advantages, after which a selection may be made as to the optimum approach by the activity. 25X1

Alternate Approach "A"

This approach utilizes three (3) hand cranks, Nos. 1, 2 and 3, as shown in Figure 3. However, all these hand cranks achieve the same operation so that the operator may rotate any of the film spools simultaneously, or separately with any of the three cranks. Any one of the cranks drives through a single dual speed mechanism. A lever allows the selection of speed, one to one (1:1) and three to one (3:1) ratio. The output of the dual speed mechanisms is connected to two (2) mechanical clutches to drive the two (2) films. The first clutch actuates spools A and B. The second clutch energizes spools C and D through reversing mechanism, which can select either direct or opposite directions. Levers are provided in one handle to select the following:

1. The first clutch may be decoupled so that only spools C and D are driven.

2. The second clutch may be decoupled where only spools A and B are driven.

3. Both clutches are coupled where A-B-C-D are driven. If the reversing mechanism is selected to be (direct) then the two films are advanced in the same direction. However, when the reversing gear is introduced, then film in spools A-B will be driven opposite as to the spools C-D.

This approach allows the operator to use one hand only to achieve all his possible required operations. If he is right handed then he uses the right hand only. If he is left handed, he uses the left hand only. He may also select to drive either films separately, together or opposite each other by the lever mechanisms.

Approved For Release 2002/08/20 : CIA-RDP78B04747A003000050001-3

25X1

25X1

The four (4) clutch boxes shown in Figure 3, are illustrated in Figure 5, each contains a unidirectional clutch, which allows slippage in one direction and direct drive in the opposite direction. When the unidirectional clutch slips, friction is introduced so that a slight drag is provided on the free wheeling spool. The clutch mechanism provides the reversal of unidirectional clutch by a reversing mechanisms. Thus, if the spool is loaded, (as shown in Diagram A, Figure 6) then the right hand spool is allowed to be driven clockwise and is free wheeling counter-clockwise. The left hand spool is allowed to be driven counter-clockwise and is free wheeling clockwise. On the other hand, if the film is loaded, as in Diagram B, then the right spool is allowed to be driven in the counter-clockwise direction while slipping in the clockwise direction. The left hand spool is allowed to be driven in the clockwise direction and free wheels in the counter-clockwise direction. The switching from Diagram A to Diagram B must be associated with the reversing of clutches in the manner shown in Figure 5, by a reversing mechanisms, which allows the same direction of motion to the operator relative to the hand crank. Thus, as he turns his hand wheel clockwise he moves this film to the right, independent of whether he has the spool loaded as in Diagram A or Diagram B. As he turns his hand wheel counter-clockwise, he moves the film to the left.

Alternate Approach "B"

This alternate approach utilizes two (2) independent hand wheels. One hand wheel is allowed to actuate the film in spools A and B and the other hand wheel independently actuates spools C and D. Three (3) cranks are provided where if the operator sits in front of the long side of the viewer then he operates with spools 1 and 2, where the right spool actuates one film and the left spool actuates the other. If he tilts the viewer so that now he sits in front of the short side he now utilizes spools 2 and 3 and drives the two separate spools independently. The four (4) clutch boxes actuating each spool are the same as described previously. These clutch boxes allow the full control of any film with one handle so that if he rotates the handle clockwise he moves the film to the right, if he rotates the handle counter-clockwise he moves the film to the left. The same provisions are made so that the spool can be placed so that the emulsion of the film is either Emulsion In or Emulsion Out, or Emulsion Up or Emulsion Down on the viewing table.

Light constant tension on the film when stationary will be retained through the friction clutches located on the four (4) retractable live center shafts at A-B-C-D.

A novel scheme is provided to automatically lift the film from the glass plate when it is driven. The film drive is actuated by pushing in with slight pressure, the segmented rollers at both sides of the light table are lifted to automatically move the film away from the glass plate. As soon as the hand wheel is released, the segmented rollers will drop to original position, putting slight tension on the film. This automatic tensioning is realized since the movable roller is brought down against an upper fixed roller, providing a constant controllable tension on the film.

25X1

25X1

In the film translating position, the hand wheel is keyed to the shaft driving the spools. When film is being viewed, the hand wheel is not engaged to the shaft, eliminating the possibility of moving film during this mode and preventing the possibility of scratching the film.

Tension is automatically removed when film is transported.

Tilt Mechanism

The tilt mechanisms for the table consists of a worm and worm wheel drive for elevating the table to 15 degrees from vertical on the short axis and to 45 degrees from vertical about the long axis.

The tilt mechanism which is a cast aluminum base will also house the power transformer and control for the illuminating source. The upper part of the mechanism is in a slide for moving from the center to one end of the Light Table. A single threaded worm mounted on a 15 degree angle to the horizontal will be used to remove backlash from the system. A wide throat worm wheel will be used for large tooth contact. The worm and worm wheel give continuous adjustment and is self locking.

The tilt mechanism assembly will be located on the central axis of the table when tilting to a 45 degree position, as shown in Figure .

The worm wheel is mounted on the table in a flange joint rotatable about the vertical axis with a two keyed position lock.

25X1

25X1

To tilt for the 15 degree position, the base will slide to one end of the table and lock. The table is then rotated 90 degrees about the vertical and locked in a keyed position. Then the worm wheel drive is now on axis parallel to the tilt and used to elevate to the required position. In this position, the bottom spools will extend into space and clear the table on which it is mounted to maintain proper balance, particularly when the loaded spools are at the top end. Two (2) continuously, and quick locking, telescoping tubings will be used to support the cantilevered arm from the rear, insuring good balance. Locking the telescoping rod will be a simple quarter turn, or a lock similar to those used on [redacted] tripods. This is a very simple but effective locking device, providing additional rigidity and stability. 25X1

When not in use, the rods will fold on the under surface of the table.

The tilt table will be electrically grounded to prevent shock hazard.

Warning light and intensity control will be on the cast base and human engineered for the most appropriate location, regardless of tilt.

[redacted] 25X1

[redacted]

25X1

CONCLUSION

This proposal presents a unique approach to achieve the design objective, which is purely mechanical. It can be readily seen from the approach presented that a completely reliable mechanical device can be made without the use of motors or electromagnetic devices.

Other design approaches will be studied to maintain simplicity and reliability.

In event of an award [redacted] is confident of successful conclusion of meeting the requirements of the exhibit. 25X1

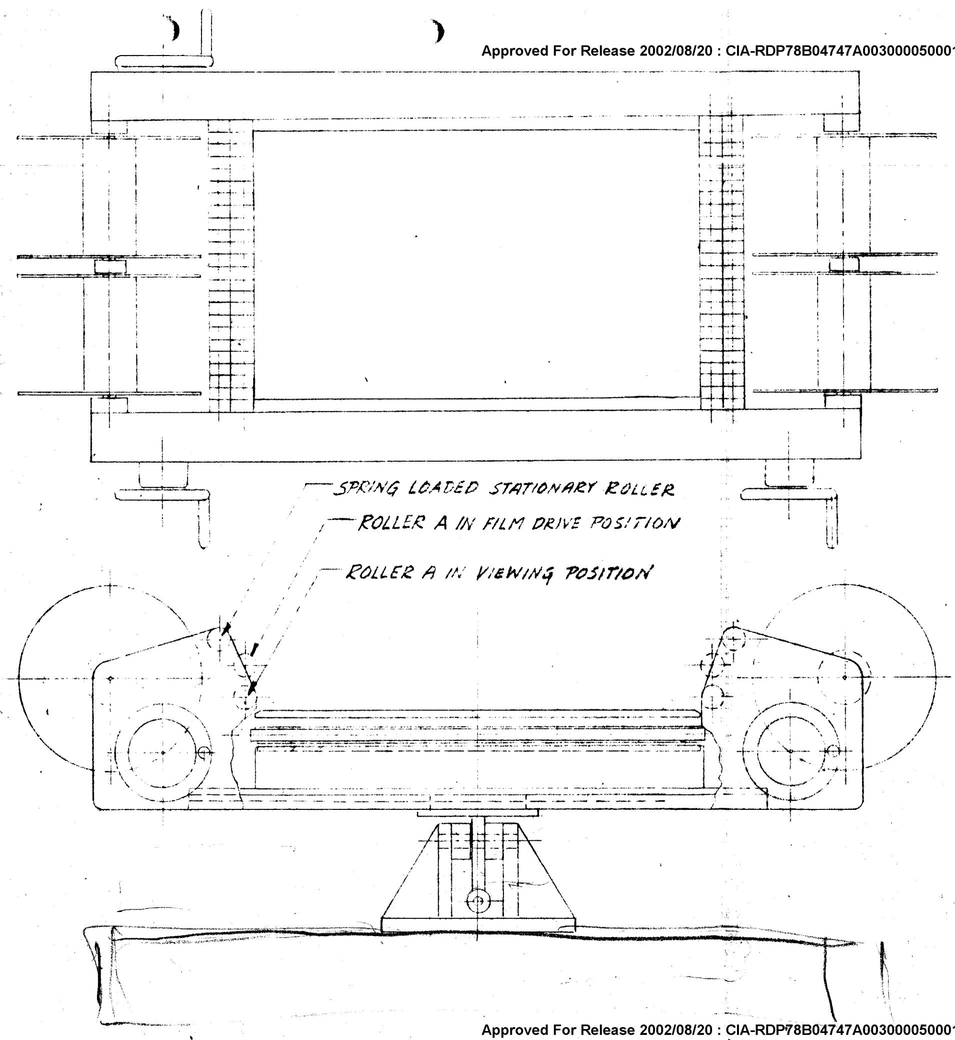

SPRING LOADED STATIONARY ROLLER
ROLLER A IN FILM DRIVE POSITION
ROLLER A IN VIEWING POSITION

FIG. 1.

25X1

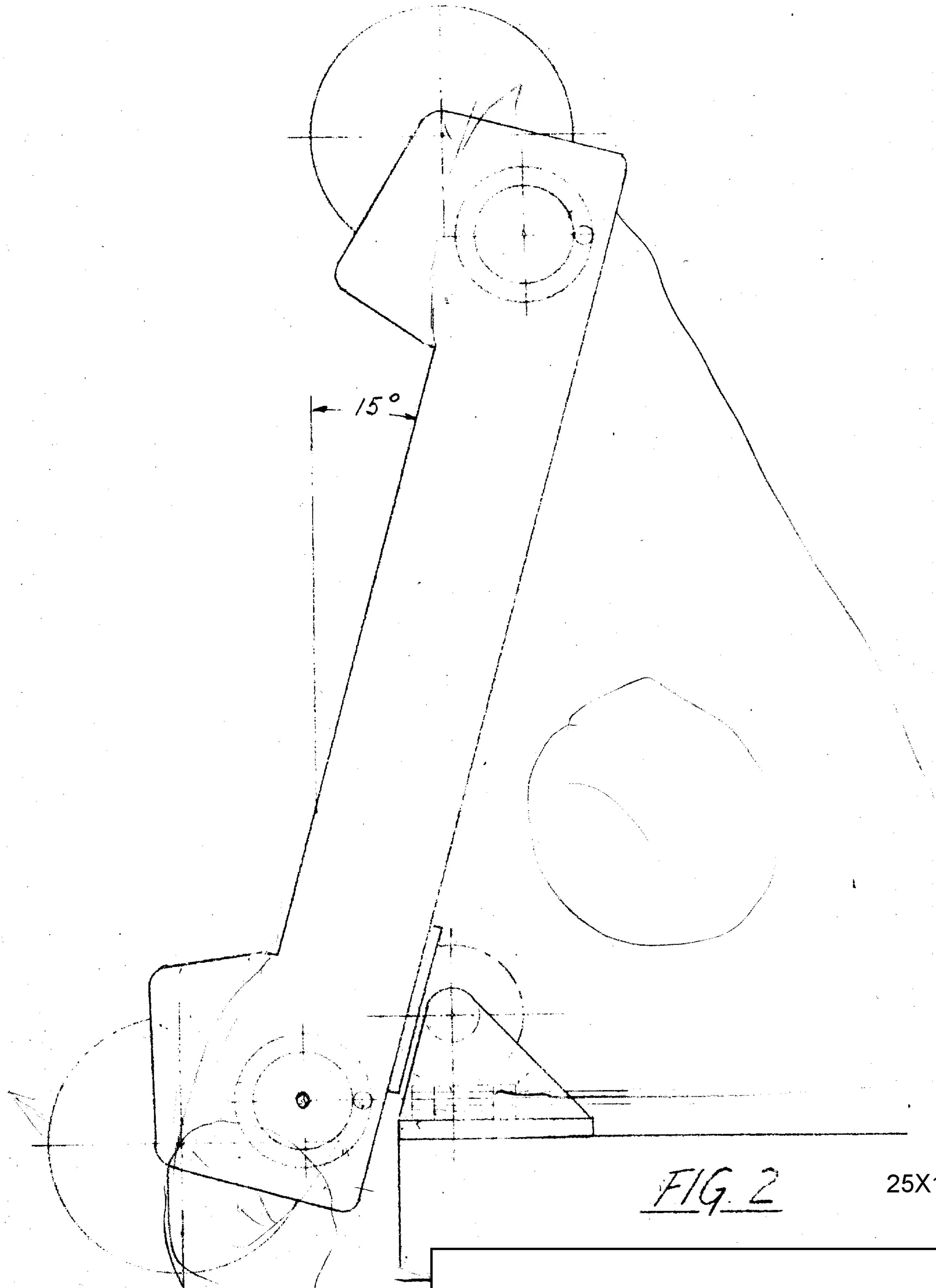


FIG. 2

25X1

Approved For Release 2002/08/20 : CIA-RDP78B04747A003000050001-3

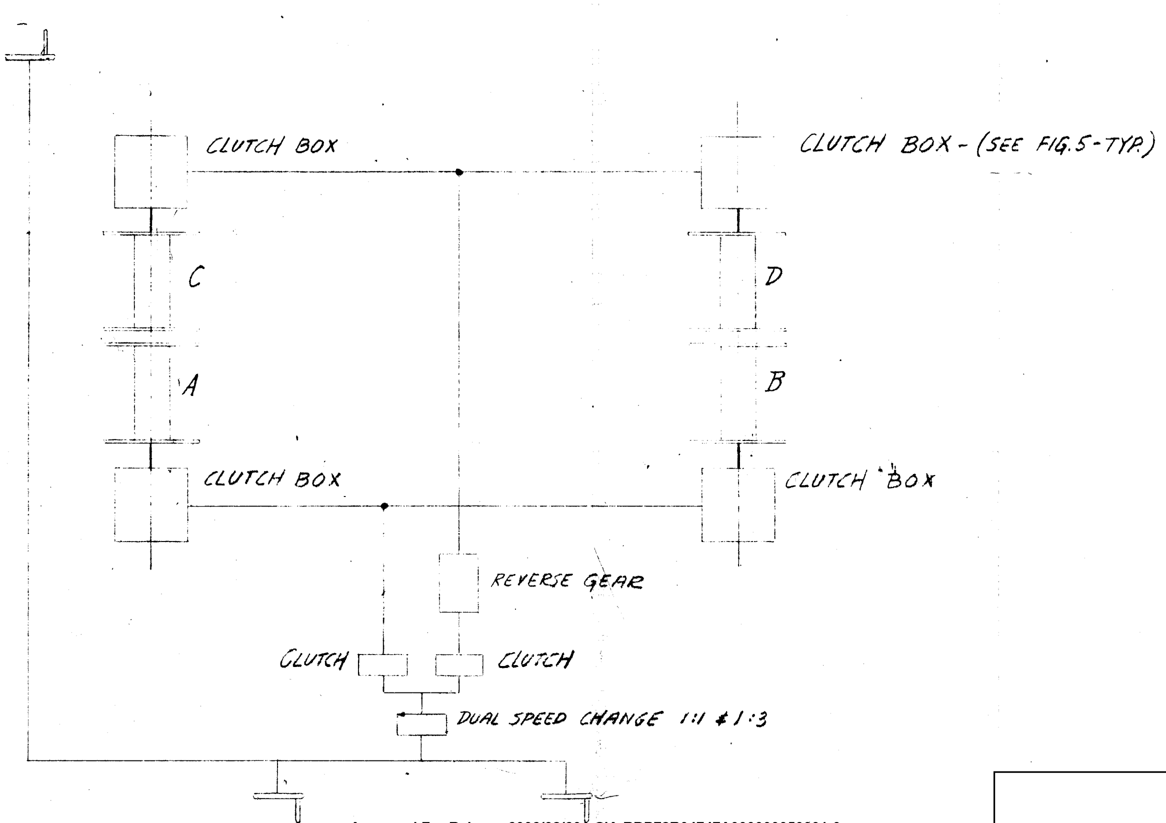


FIG. 3
ACCEPTED

25X1

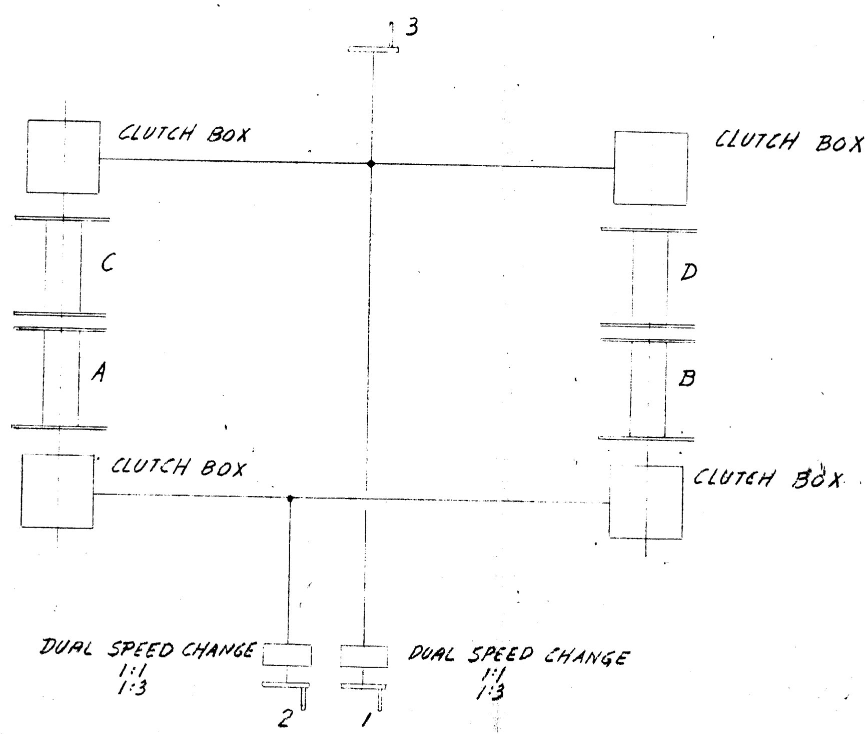

3
CLUTCH BOX
CLUTCH BOX
C
D
A
B
CLUTCH BOX
CLUTCH BOX
DUAL SPEED CHANGE
1:1
1:3
DUAL SPEED CHANGE
1:1
1:3
2
1

FIG. 4

25X1

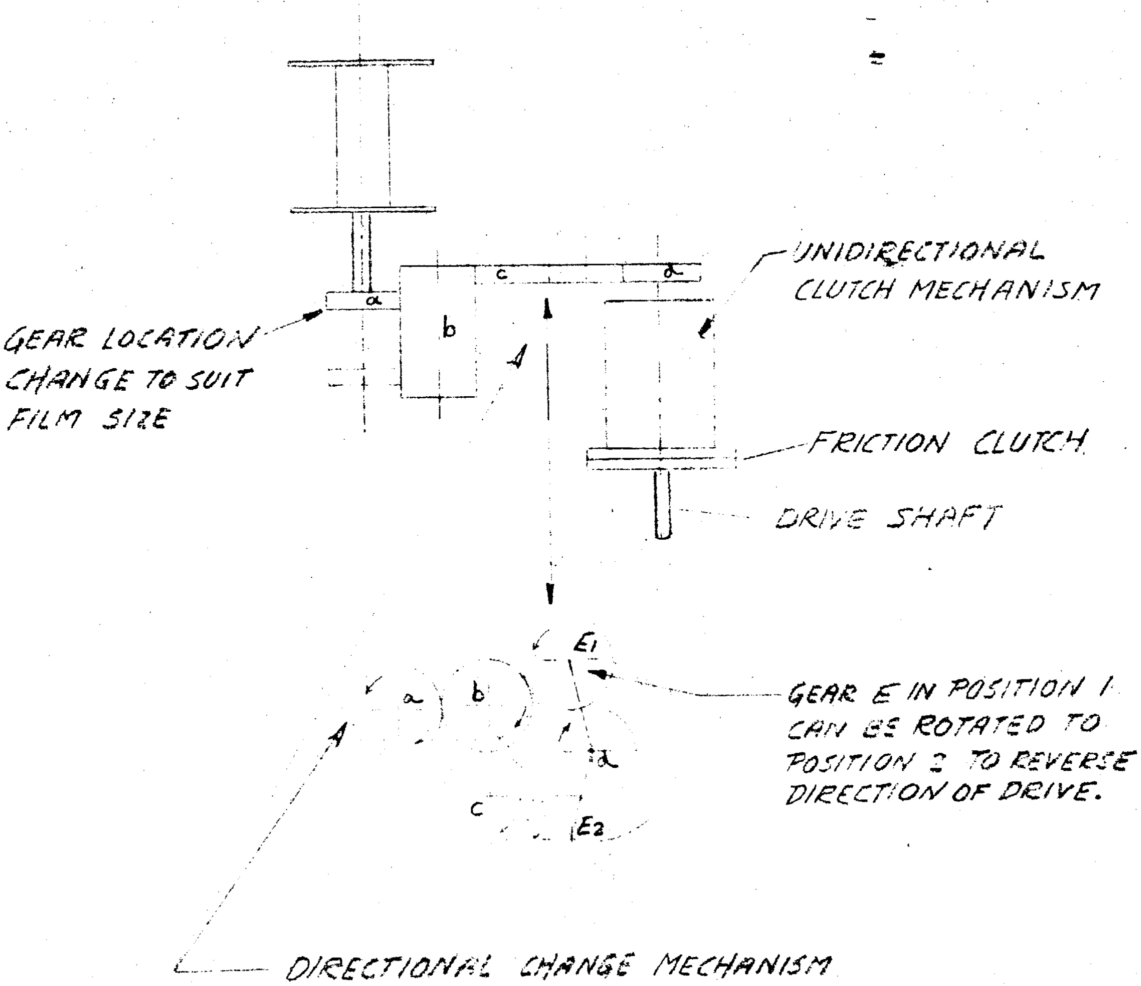
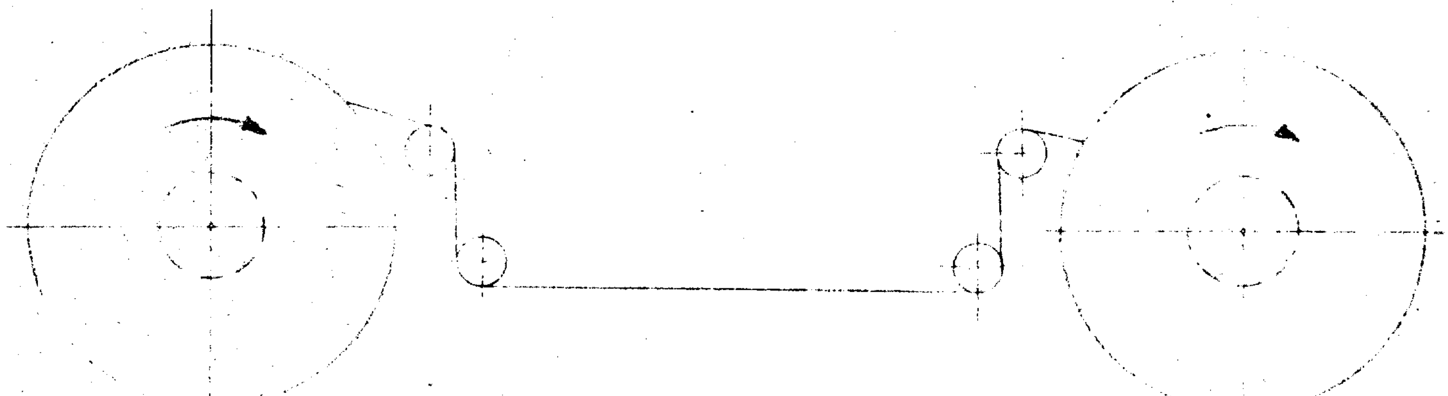


FIG. 5

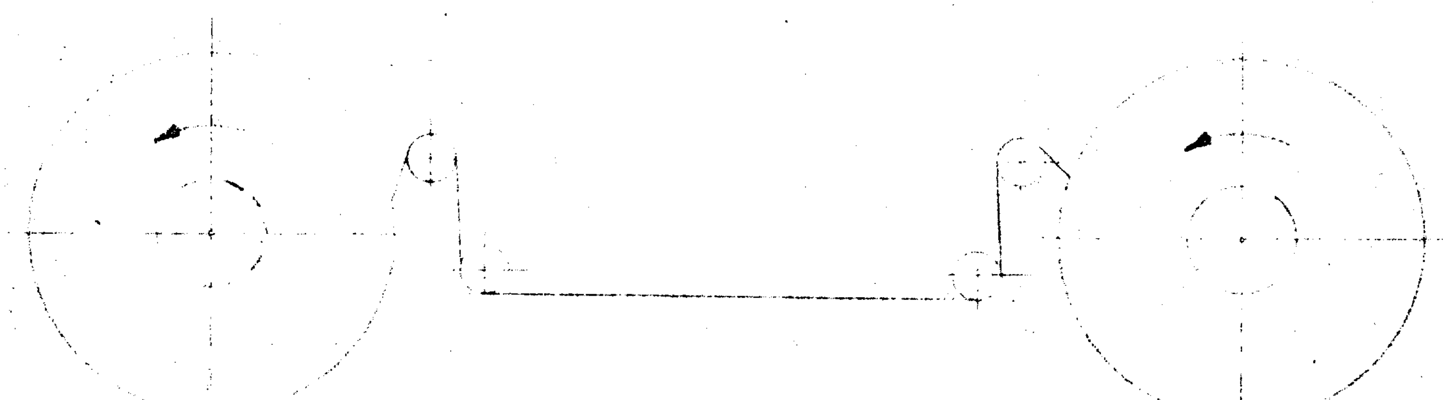
BOX

25X1



EMULSION SIDE DOWN

A



EMULSION SIDE UP

B

FIG. 6

25X1

25X1

Approved For Release 2002/08/20 : CIA-RDP78B04747A003000050001-3

[redacted]

[redacted]

25X1
25X1

[redacted]

25X1

Proposal [redacted]

25X1

ADVANCED FILM-VIEWING LIGHT TABLE WITH A TRANSLATING MICROSCOPE CARRIAGE AND HIGH INTENSITY TRACKING LIGHT SOURCE

MC-T

25X1

[redacted]

21 April 1964

COPY NO. 2 of 4

25X1

25X1

ADVANCED FILM-VIEWING LIGHT TABLE
WITH A TRANSLATING MICROSCOPE CARRIAGE
AND HIGH INTENSITY TRACKING LIGHT SOURCE

This proposal describes a design approach achieving the design objective for an Advanced Film-Viewing Light Table with a Translating Microscope Carriage and High Intensity Tracking Light Source in accordance with Development Objectives dated 27 March 1964. In the event of an award, the first consideration in the design will be to make a complete human engineering and mechanical analysis to determine the simplest and most reliable approach consistent with the design objective. The final design will not commence until all parameters to meet the objective have been firmly established. This proposal is similar to "Advanced Film-Viewing Light Table With A Translating Microscope Carriage" proposal, with an added High Intensity Tracking Illuminating Device. A separate section of this proposal describes the Tracking Device.

Basic Concept

In this design we have employed the use of thin wall ribbed aluminum castings to provide rigidity as well as strength. 356T6 aluminum is being considered. Although we are considering the use of fabricated metal and plate type construction for the light table, the cast material concept provides the freedom of design, allowing human engineering requirements to be most advantageously carried out. There is also the advantage of acquiring an aesthetically produced light table without additional cost.

25X1

25X1

The use of cast members will naturally provide economies in any future procurement.

The overall size of the table is 55 inches long, 21 inches wide and 7 inches high, minus the carriage, scope and reels.

General Description

As shown in Figure 1, the Viewing Light Table is provided with an 11 x 40 illuminated area for viewing single rolls of 9 1/2" - 5" and 70mm film, or two (2) rolls of either 5 inch or 70mm film in 500 foot capacity. The Light Table contains the light source and power supply, diffuser, glass plate top, mechanism for transporting film, associated controls, tilt and elevating mechanism, translating carriages, and adapters for microscopes.

Detailed Description

Figure 1, displays a cross section of the Light Table showing the transparent top, adjustable shade, plastic diffuser, light source and side channels for the transport mechanism. The top plate is made of glass with beveled edges.

The shades are made of synthetic rubberized fabric, mounted on rollers with the pulled edge of the shade supported between the diffuser and the glass top. The leading edges of the shades are metal edged for rigidity.

The shades are located at the edges of the long side of the table, extendable across the short dimension. The shades may be extended across the entire illuminated area from 0 to 9 inches from an edge. The shades are actuated by small belts over pulleys from knobs flush mounted near the top surface. A lock-in feature is provided.

 25X1

[redacted]

25X1

The diffuser will be an opal plastic. The light source will be a shock mounted cold cathode type with a variable illumination from 15% to 100% without flicker. The illumination will provide 1500 foot lamberts at the glass top surface. 2000 foot lamberts, or more, is a design goal. If the 110°F surface temperature of the top plate cannot be maintained with a heat sink, a small blower will be introduced to remove hot air. If a blower is needed, it will be a "muffin" fan type, which is essentially silent and vibration free.

25X1

[redacted] manufactured a model [redacted] Light Table with 10 inch x 20 inch illuminated area having a brightness level of 2,200 foot lamberts at its maximum setting. The temperature rise is 22°F when film having a density of 3.0, is placed on top of the table. When no film is present, then the maximum temperature rise is 20°F. 25X1

The above is presented to illustrate the investigations we are presently conducting. Such lamps are available for demonstration purposes.

The spool loading mechanisms consist of live driving centers, adjustable to pre-located key positions for selecting the proper size spool. One each is located at A-B-C-D. The live center will contain a gear which will remain meshed with a pinion. After it is moved, it will be locked in to the changed positions. The keyed pre-located positions will be identified by a mark for simplicity of locating.

 25X1

[redacted]

[redacted]

The center post is fixed, located on the center line of the long axis of the Light Table. It is hinged so that it may be moved out of the way when 9 1/2 inch spools are used. A simple locking device will be used to hold it in position when 70mm or 5 inch spools are used. The pivot center on the center post between the spools will be made of hardened steel for durability. The advantage to pivoting the center post, is that it eliminates the possibility of misplacement or accidental loss of the part. 25X1

As shown in Figure 1, the Light Table will accommodate one (1) 9 1/2 inch, dual 70mm or 5 inch spools, or one (1) 70mm and one (1) 5 inch spool.

Segmented rollers are used so film may be transported with emulsion side up or down, or in various widths simultaneously.

The film transport proposed is purely mechanical, providing the necessary directional travel functions. A two (2) speed mechanical gear shift for one to one (1:1) ratio and three to one (3:1) for slewing is provided for two spools at one end of the table.

The configuration of the dual spool drives can be selected as one of two alternate approaches, separately shown in Figures 3 and 4. Each approach has its own merits, and separate evaluation will be made [redacted] during the design phase to determine the comparable reliability and human engineering advantages, after which a selection may be made by the activity as to the optimum approach. 25X1

Alternate Approach "A"

This approach utilizes two (2) hand cranks, Nos. 1 and 2, as shown in Figure 3. However, either of these hand cranks achieves the same operation so that the operator may rotate any of the film spools simultaneously, or separately with either of the two cranks. Any one of the cranks drives through a single dual speed mechanism. A lever allows the selection of speed, one to one (1:1) and three to one (3:1) ratio. The output of the dual speed mechanisms is connected to two (2) mechanical clutches to drive the two (2) films. the first clutch actuates spools A and B. The second clutch energizes spools C and D through reversing mechanism, which can select either direct or opposite directions. Levers are provided in one handle to select the following:

1. The first clutch may be decoupled so that only spools C and D are driven.

2. The second clutch may be decoupled where only spools A and B are driven.

3. Both clutches are coupled where A-B-C-D are driven. If the reversing mechanism is selected to be (direct) then the two films are advanced in the same direction. However, when the reversing gear is introduced, then film in spools A-B will be driven opposite as to the spools C-D.

This approach allows the operator to use one hand only to achieve all the required operations. If he is right handed then he uses the right hand only. If he is left handed, he uses the left hand only. He may also select to drive either films separately, together or opposite each other by the lever mechanisms.

ILLEGIB

Approved For Release 2002/08/20 : CIA-RDP78B04747A003000050001-3

25X1

25X1

The four (4) clutch boxes shown in Figure 3, are illustrated in Figure 5, each contains a unidirectional clutch, which allows slippage in one direction and direct drive in the opposite direction. When the unidirectional clutch slips, friction is introducted so that a slight drag is provided on the free wheeling spool. The clutch mechanism provides the reversal of unidirectional clutch by a reversing mechanisms. Thus, if the spool is loaded, (as shown in Diagram A, Figure 6) then the right hand spool is allowed to be driven clockwise and is free wheeling counter-clockwise. The left hand spool is allowed to be driven counter-clockwise and is free wheeling clockwise. On the other hand, if the film is loaded, as in Diagram B, then the right spool is allowed to be driven in the counter-clockwise direction while slipping in the clockwise direction. The left hand spool is allowed to be driven in the clockwise direction and free wheels in the counter-clockwise direction. The switching from Diagram A to Diagram B must be associated with the reversing of clutches in the manner shown in Figure 5, by a reversing mechanisms, which allows the same direction of motion to the operator relative to the hand crank. Thus, as he turns his hand wheel clockwise he moves this film to the right, independent of whether he has the spool loaded as in Diagram A or Diagram B. As he turns his hand wheel counter-clockwise, he moves the film to the left.

Approved For Release 2002/08/20 : CIA-RDP78B04747A003000050001-3

25X1

25X1

Alternate Approach "B"

This alternate approach utilizes two (2) independent hand wheels. One hand wheel is allowed to actuate the film in spools A and B and the other hand wheel independently actuates spools C and D. The four (4) clutch boxes actuating each spool are the same as described previously. These clutch boxes allow the full control of any film with one handle so that if he rotates the handle clockwise he moves the film to the right, if he rotates the handle counter-clockwise he moves the film to the left. The same provisions are made so that the spool can be placed so that the emulsion of the film is either Emulsion In or Emulsion Out, or Emulsion Up or Emulsion Down on the viewing table.

Light constant tension on the film when stationary will be retained through the friction clutches located on the four (4) retractable live center shafts at A-B-C-D.

A novel scheme is provided to automatically lift the film from the glass plate when it is driven. The film drive is actuated by pushing in with slight pressure, the segmented rollers at both sides of the light table are lifted to automatically move the film away from the glass plate. As soon as the hand wheel is released, the segmented rollers will drop to original position, putting slight tension on the film. This automatic tensioning is realized since the movable roller is brought down against an upper fixed roller, providing a constant controllable tension on the film.

 25X1

25X1

In the film transporting position, the hand wheel is keyed to the shaft driving the spools. When film is being viewed, the hand wheel is not engaged to the shaft, eliminating the possibility of moving film during this mode and preventing the possibility of scratching the film.

Tension is automatically removed when film is transported.

Translating Microscope Carriage

Very careful consideration has been given to the Translating Microscope Carriage design in view of the requirements of paragraph 4.5.3.4 rigidity to meet the deflection specification the rail design will utilize the strength and rigidity of the light box casting as a continuous support under the rails.

As shown in diagram, Figure 1, each rail will be made of flat, hardened and ground steel for durability and chrome plated for corrosion resistance. The rails will run the entire length of the light box and will have a probable cross section of 3/8 inch x 1 1/2 inch and adequately secured to the light box casting.

The Translating Carriage will be made of cast meehanite, ground and lapped for accuracy.

The X Carriage, as illustrated, will have a three point ball bearing support on the rails; two bearings at the rear and one bearing at the front. The rear bearings will be rigidly mounted to eliminate backlash. The X Carriage will have a dovetail accommodating a plate which is the substage for ± 2CM of movement in the X axis after the translation in this axis has taken place.

 25X1

25X1

The top surface of the X substage carriage has a dovetail machined in its top surface.

The Y Carriage slide fits in this dovetail to permit translation in Y motion. One side of the dovetail carries spring loaded ball bearings to eliminate backlash.

The Y Carriage slide also carries a subplate which serves as the rotating mount for the microscopes.

Each microscope will have its own adapter, which can be inserted into the Y Carriage slide and rotatable for 180° for use parallel to either the X or Y axis of the Light Table and from either side.

The X and Y substages will contain 1mm pitch precision screws accurate to .001mm + .01% of the total distance being measured. The dials will be of sufficient diameter to permit a least count reading to .0005mm. A scale graduated in 1mm increments will be used to count the number of revolutions of the calibrated dial.

Both X and Y Carriages are equipped with positive locks when measurements lock.

Microscopes are not furnished as a part of this proposed equipment.

A unique method is employed for controlling the illumination supplied by the high intensity light source and tracking with the light source.

25X1

25X1

Illumination

Illumination for high intensity will be provided by a blower cooled lamp and condenser optics equipped with an iris control, and transmitting this light through two (2) fiber optics light pipes.

One end of the light pipe will receive the light from the lamp and transmit it to the optical path of the microscope objective. The light pipe will be of the incoherent type and of sufficient flexibility to track over the entire area.

Alignment of the high intensity light sources to the separate objectives and/or rhomboids of a microstereoscope or beneath the single objective of a stereomicroscope will be accomplished with two (2) sets of magnets. One set mounted in the translating carriage, the other will be mounted under the glass top.

One magnet will be placed at one end of the light pipe and positioned so the direction of light emitting from the pipe will be optically centered about the microscope objectives.

Figure 7, shows a diagram of the proposed construction.

To prevent scratching the underside of the plate glass, the upper surface of the magnet will not come in contact with the glass. A series of nylon balls will be placed in cavities so that only rolling friction of the plastic balls will be in contact with the glass. The magnets will be shaped in the form of a ⊔ with the light pipe attached to the open end of the ⊔ .

 25X1

25X1

Magnetic coils to which current can be applied will be located on the translating carriage to increase the pulling power of the magnets. These coils can be manually located to center the high intensity source at proper location and then locked in. Any movement of the carriage will then be tracked by the high intensity light source.

We believe that this design will meet the color temperature requirements of 3500° to 5500K, giving variable intensity of 50 to 100% without reducing the Kelvin temperature below 3500°K and preventing distortion to the film due to the long light pipe path from the illuminating source.

The high intensity lamp will be located in the base of the light table. All other parts of construction for this table will be the same as for the Advanced Film-Viewing Light Table With A Translating Microscope Carriage.

The following alternate approach to the tracking light sources will also be investigated. Each tracking light source will be mounted in a swivel joint, as shown in Figure 4, and supported by a C shape rod which is horizontal. The bottom leg of the C will support the end of the fiber optics cable under the glass top. The vertical section of the C will be supported in a member which will permit rotation and translating motion across the short dimension of the table for a distance of two (2") inches. The upper part of the open C will be used as a handle with which to manipulate the light source under the objective of the microscope. Locking knobs will be used to firmly hold the light sources during tracking. An elongated slot at the rear of the light table will be entered by one leg of the C during tracking operation. Two (2) high intensity sources are provided.

25X1

When the microscope is stowed or placed at the long edge nearest the operator, the overall width will be 21 inches. When the microscope is placed at the farthest long edge away from the operator the yoke supporting the light source will extend an additional 10 inches. This condition occurs during operation of the unit.

25X1

[redacted]

25X1

[redacted]

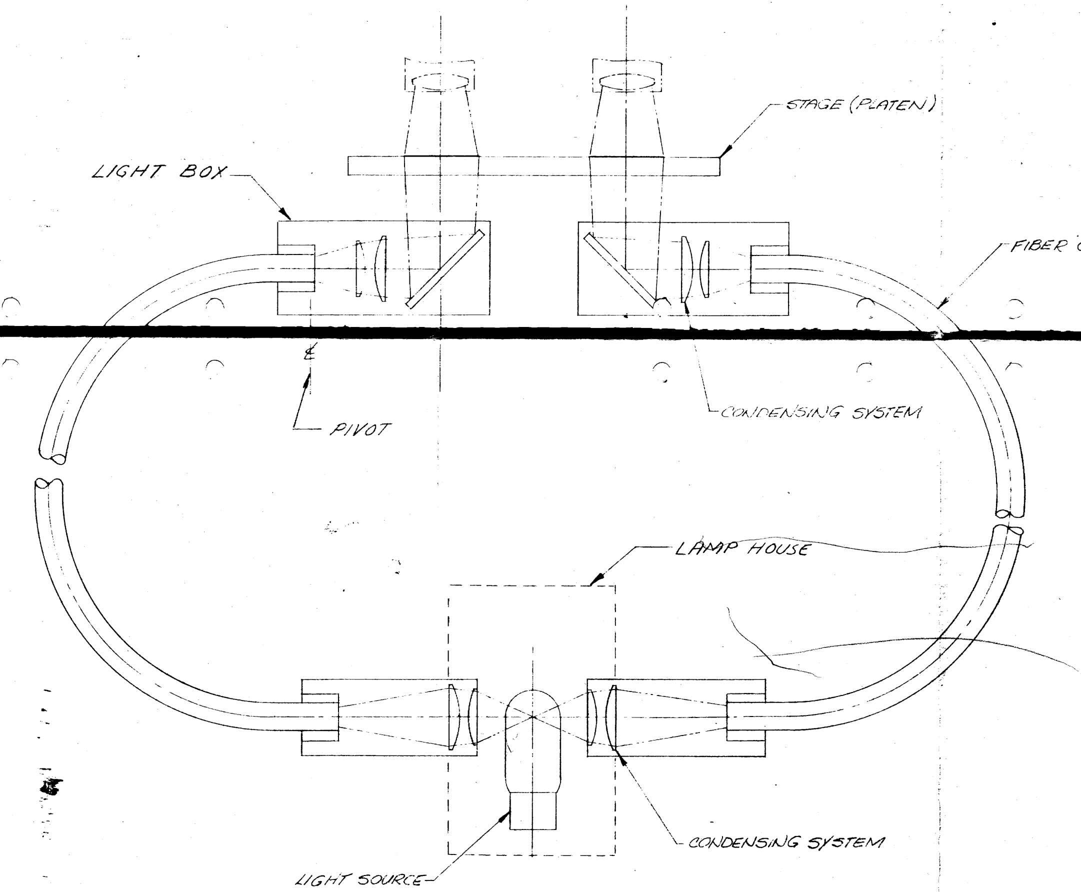
25X1

CONCLUSION

This proposal presents a unique approach to achieve the design objective, which is purely mechanical. It can be readily seen from the approach presented that a completely reliable mechanical device can be made without the use of motors or electromagnetic devices.

Other design approaches will be studied to maintain simplicity and reliability.

In event of an award, [redacted] confident of successful conclusion of meeting the requirements of the exhibit. 25X1



25X1

FIG. 2
PROPOSAL*

SCHEMATIC DIAGRAM
HIGH INTENSITY LIGHT SOURCE

25X1

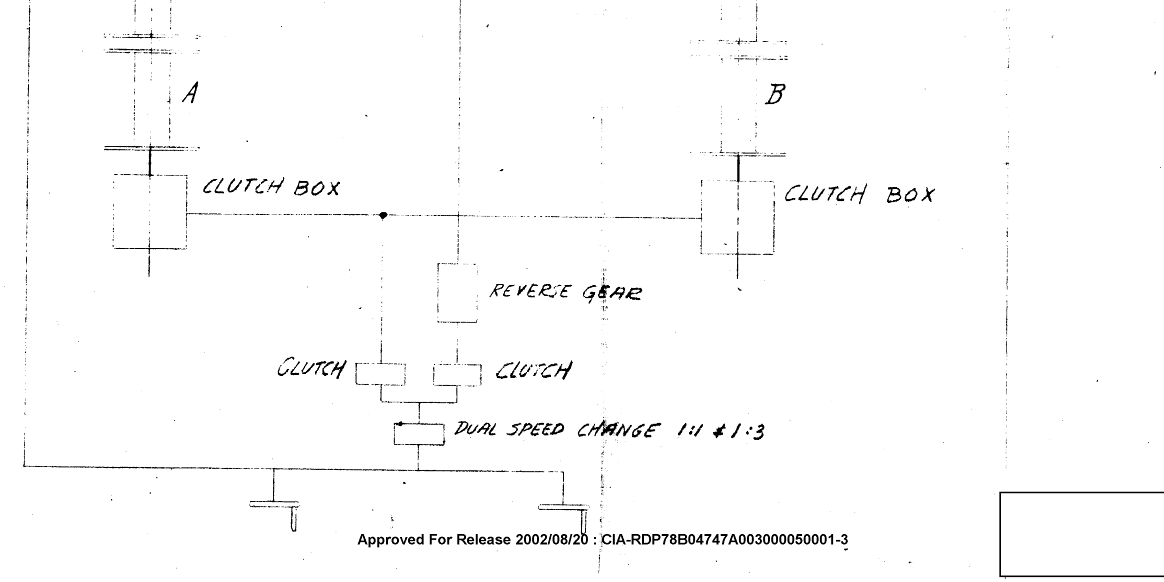

CLUTCH BOX
CLUTCH BOX - (SEE FIG.5-TYP.)
C
D
A
B
CLUTCH BOX
CLUTCH BOX
REVERSE GEAR
CLUTCH
CLUTCH
DUAL SPEED CHANGE 1:1 & 1:3

FIG. 3

25X1

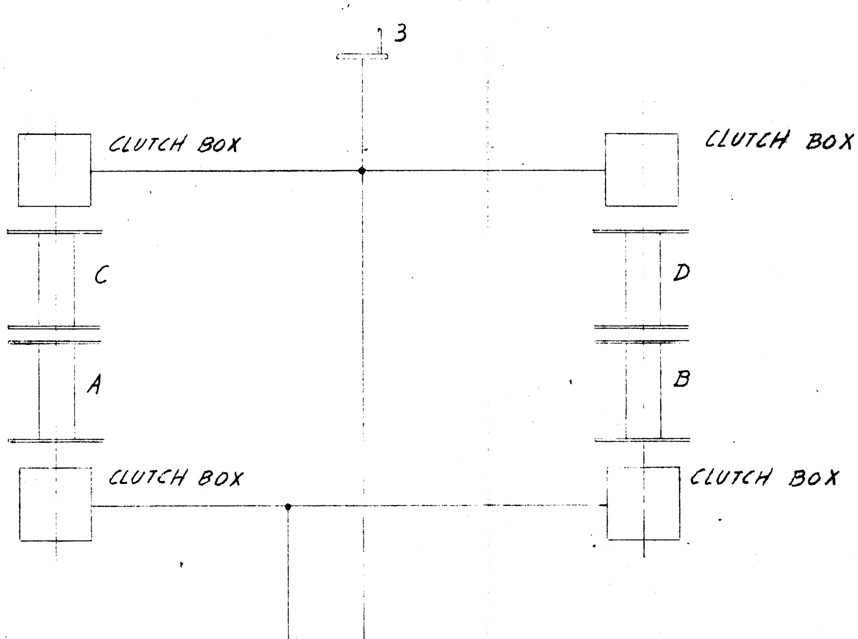

3
CLUTCH BOX
CLUTCH BOX
C
D
A
B
CLUTCH BOX
CLUTCH BOX
DUAL SPEED CHANGE
1:1
1:3
DUAL SPEED CHANGE
1:1
1:3
2
1

FIG. 4

25X1

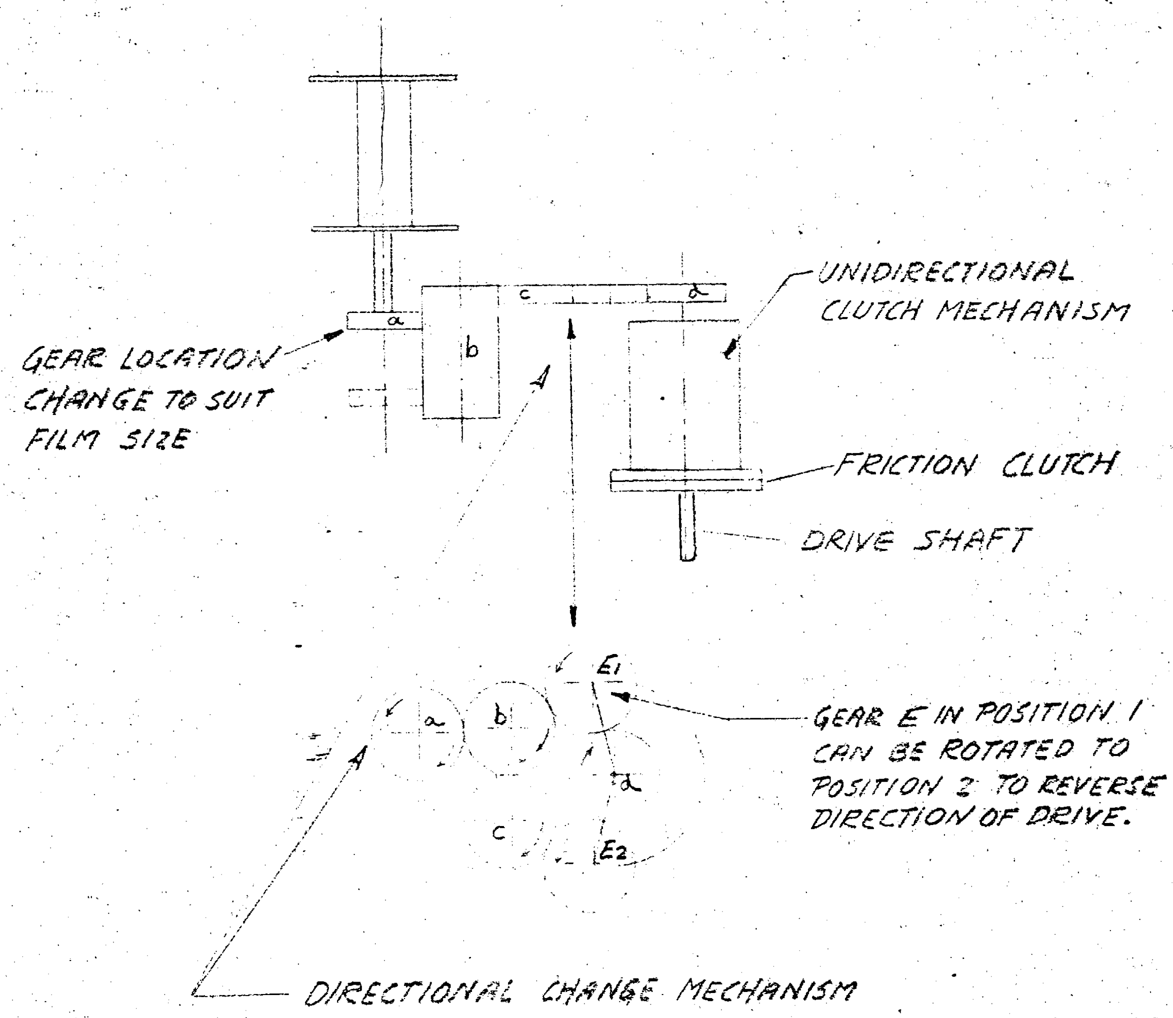
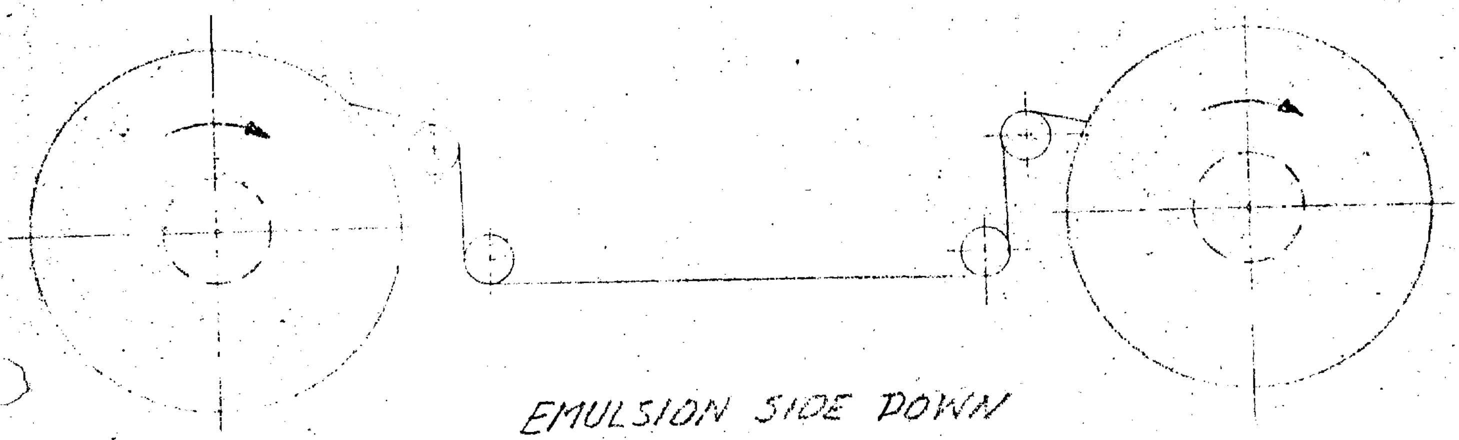


FIG. 5
CLUTCH BOX

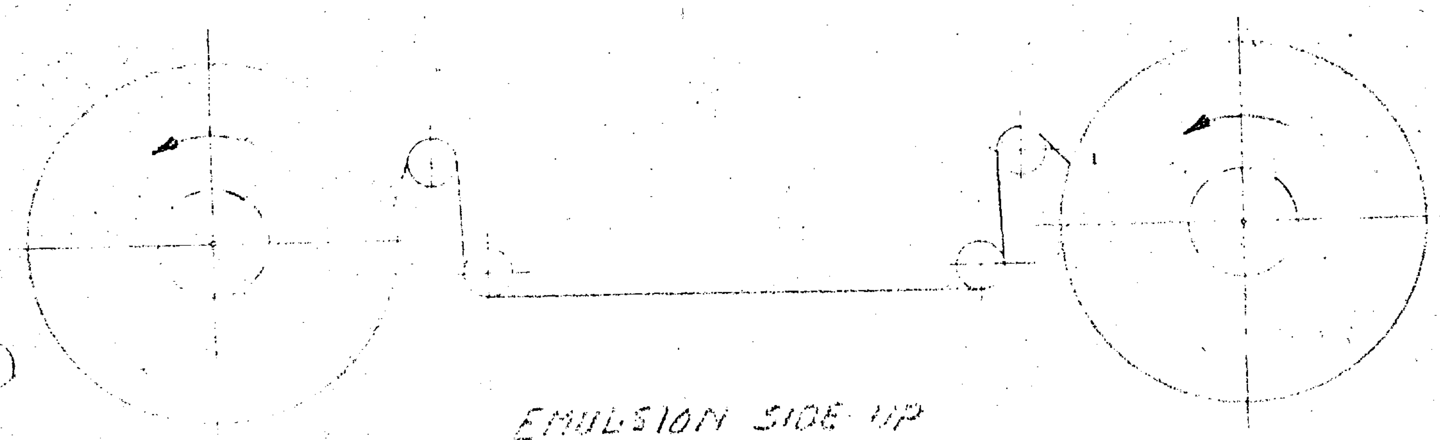
25X1

Approved For Release 2002/08/20 : CIA-RDP78B04747A003000050001-3



EMULSION SIDE DOWN

A

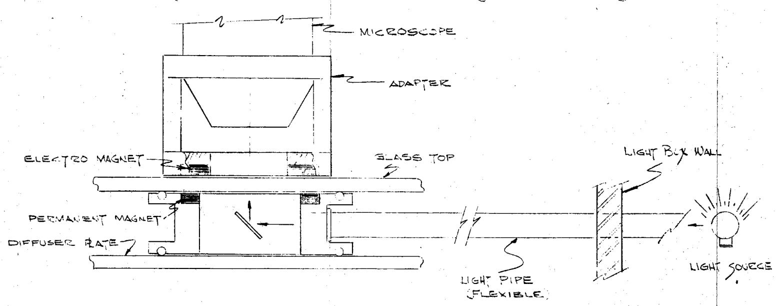


EMULSION SIDE UP

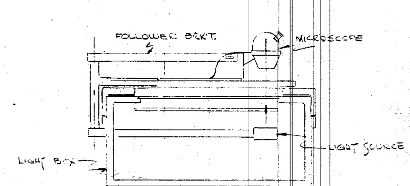
B

FIG. 6

25X1



HI-INTENSITY LIGHT SOURCE



ALTERNATE HI-INTENSITY LIGHT SOURCE

FIG. #7 PROPOSAL

25X1

25X1

ILLEGIB